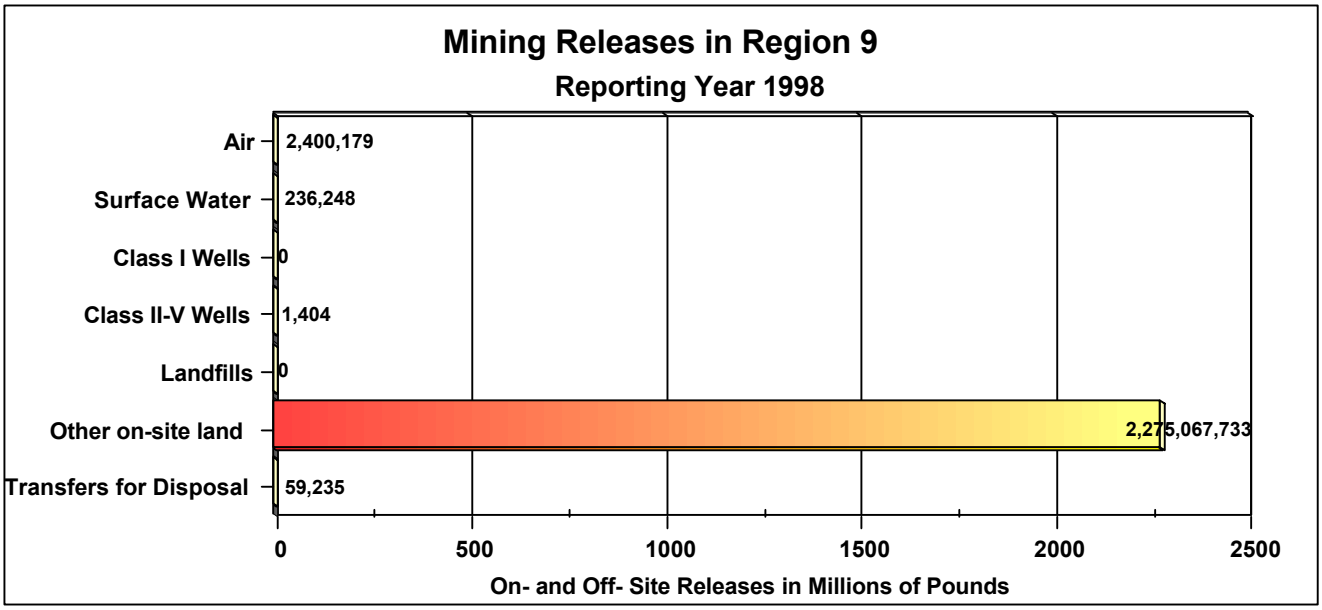
Metal Mining: 1998 Toxics Release Inventory

U.S. EPA Region 9
Arizona, California, Hawaii, Nevada, and the Pacific Islands



Since 1987, the Toxics Release Inventory (TRI) has collected information on the annual release and management of toxic chemicals from manufacturing facilities. The reporting requirements were recently expanded, and the 1998 version of the TRI contains the first reports from seven new industry sectors, including metal mining. This fact sheet is designed to help people understand the information reported by metal mines.

What did the metal mines report as releases for 1998?

The metal mining industry reported 3.5 billion pounds of releases. The chemicals that contributed the most to the metal mining sector's total releases were copper compounds (1.2 billion pounds), zinc compounds (616 million pounds), and arsenic compounds (513 million pounds). The majority of releases from this sector are to land on-site.

In Region 9, 57 facilities reported 2.3 billion pounds of releases, or about 66% of the Nation's total releases from metal mines. Most of the releases (over 99.9%) are on-site land. About 0.1%, or 2.4 million pounds, were released to the air. Chemicals released to the air include copper, zinc, arsenic, ammonia, hydrogen cyanide, and mercury.

What are the reporting requirements for mines?

The TRI regulations require metal mines to file reports for every toxic chemical on the TRI regulatory list that the mine used over threshold amounts. The reporting thresholds are 25,000 pounds for chemicals that are manufactured or processed and 10,000 pounds for chemicals that are otherwise used.

Some mining operations are not subject to TRI reporting. These include those with under ten employees, and iron, uranium, radium, and vanadium mines.

What kind of information is reported? What are "releases"?

For each chemical used over threshold, facilities estimate and report the amount released to each environmental medium, and information on pollution prevention and waste management activities. On-site releases are the amounts emitted to the air, discharged to surface waters, injected to wells, or disposed of on the land. Total releases are on-site releases plus amounts sent off-site for disposal.

Why did metal mines report such large volumes of land releases?

In order to get at an ore body, some mines must remove a large amount submarginal ore, or waste rock, and dispose of it. This material may contain trace amounts of various heavy metals, and if reporting thresholds are exceeded elsewhere in the facility, the amount of these TRI-listed chemicals that are disposed must be reported.

Some mines also produce tailings, which is the processed rock that remains after the target metal is extracted from the ore. Tailings often contain various other metals, such as chromium or copper, that also may be reported when disposed. Because of the enormous amount of material moved and processed at mines, the amount of metal disposed, even at low concentrations, can be quite high.

Why are TRI chemicals in waste rock important to know about?

The previously buried metals in waste rock are exposed to the elements upon excavation and become susceptible to leaching by rain and snow. Unless carefully controlled and monitored, the leaching process can lead to ground and surface water sources contaminated with heavy metals and other toxic chemical pollution that would not have occurred naturally. Significant factors are the chemistry of the rock, particle size, precipitation rates, and most importantly, a mine's operating and waste management practices. A review of historical mines that have become Superfund sites indicates that in most cases, the primary cause of environmental damage comes from improperly managed waste rock and tailings dumps. For this reason, many states have regulations that guide mine design, reclamation, and closure.

Why do some mines report for many metals, and others for none at all?

TRI regulations require that mines calculate and provide release estimates only for chemicals for which they have exceeded manufacture, process, or otherwise use thresholds. Some ore beneficiation processes, such as roasting and autoclaving, cause reporting thresholds to be exceeded for all the metals present in the ore, requiring release reports to be prepared for each metal compound, while other processes do not.

Why do some mines have such high releases of cyanide?

Sodium cyanide is used by some mines to leach gold out of ore. It is reportable as a member of the cyanide compounds category, and is released mostly to the land. As sodium cyanide degrades, hydrogen cyanide may be created and released to the air. However, hydrogen cyanide is a separately listed chemical, and under the TRI regulations, a facility must do separate threshold and release calculations for that chemical. In effect, a mine would report air releases of hydrogen cyanide only if more than 25,000 pounds of hydrogen cyanide were created and released. The quantity of cyanide used and released depends on the size of the mine and the type of processing the mine uses.

Isn't cyanide very toxic?

Yes, cyanide is a very toxic material when inhaled as hydrogen cyanide or ingested orally as sodium cyanide or some other cyanide salt. Mines using cyanide to leach metals such as gold from rock are expected to employ strict controls over their use of cyanide and the generation of any waste that might contain cyanide. Open-air facilities rarely, if ever, have a high enough concentration in the air to be a human health risk.

Many vitamin supplements contain metals like zinc and selenium. Why are they on the TRI list?

Though metals are natural substances, in certain forms or concentrations they can be harmful to human health and/or the environment, and for that reason they are on the reporting list.

Most creatures need trace amounts of many metals, while more concentrated forms can often be toxic. Also, different species have different sensitivities to metal exposure. For example, certain wildlife is more sensitive to copper and selenium than humans.

Some mines report stack air releases of mercury compounds. Why?

Mercury is no longer used, as it had been historically, to remove gold from ore. The mercury emitted originates as a naturally occurring element often found in gold-bearing ore. Some mines use heat to pretreat ore to improve leaching characteristics, a step which may generate air releases of mercury. Another emission point is at the retort/refinery process–as mercury is generally leached out of the ore along with gold, it must be removed from the final product. To do this, some facilities use heat to vaporize mercury, most of which is then captured and sold as a product.

Where can I get reports and documents regarding mining issues?

For more detailed information on the processes and environmental effects mining, see:
EPA's Technical Resource Document–Volume 2: Gold (EPA 530-R-94-013).
EPA's Technical Resource Document–Volume 4: Copper (EPA 530-R-94-031).
EPA's Sector Notebook: Profile of the Metal Mining Industry (EPA 310-R-95-008)

These documents are available over the Internet at:
http://www.epa.gov/epaoswer/other/mining/techdocs/gold.htm
http://es.epa.gov/oeca/sector/sectornote/pdf/metminsn.pdf

Many TRI documents are available from the National Center for Environmental Publications.
Telephone: (800) 490-9198
http://www.epa.gov/ncepihom

There is information at the web site for the Nevada Division of Environmental Protection:
http://www.state.nv.us/ndep/admin/tripress.htm
and the Nevada Small Business Development Center
http://www.nsbdc.org/BEP.html

Information and Assistance

We will be more than happy to answer your questions and assist you in learning more about the Toxics Release Inventory Program in Region 9.

U.S. EPA Region 9 TRI Coordinators
Adam Browning, (415) 744-1121
Patricia Monahan, (415) 744-1109